Remote Alarm Box RAB &
Remote Alarm Box for Remote Light RAB RL

Service Manual

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GE Medical Systems
Information Technologies

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CONTENTS

1 INTRODUCTION 4

1.1 MANUAL INFORMATION 4
1.2 SAFETY INFORMATION 6
1.3 SERVICE INFORMATION 8
1.4 TERMINOLOGY 9
1.5 HOW TO REACH US 10

2 EQUIPMENT OVERVIEW 12

2.1 PRODUCT DESCRIPTION 12
2.2 LED INDICATOR DESCRIPTION 13
2.3 DESCRIPTION OF OPERATION 14
2.4 SPECIFICATION MECHANICAL, ELECTRICAL 15

3 MAINTENANCE 16

3.1 MAINTENANCE SCHEDULE 16
3.2 VISUAL INSPECTION 17
3.3 GENERAL CLEANING 18
3.4 CHECKOUT PROCEDURES 19
3.5 ELECTRICAL SAFETY TEST 21
3.5.1 Ground (Earth) Wire Leakage Current Tests 22
3.5.2 Enclosure Leakage Current Test 24
3.6 MAINTENANCE BLINK MODE 25

4 TROUBLESHOOTING 26

4.1 ELECTROSTATIC DISCHARGE (ESD) 26
4.2 RAB / RAB RL FOR YOUR SAFETY 27
4.3 SERVICE MODE RAB / RAB RL 27
4.4 TROUBLESHOOTING FAQ'S 28

5 CONFIGURATION 30

5.1 CONFIGURATION JUMPER 30
5.2 CONNECTING THE CABLE TO THE HOSPITAL ALARM SYSTEM 31
5.3 CONNECTING THE ALARM LIGHT (RAB RL) 32
5.4 CONNECTING THE POWER SUPPLY UNIT (RAB RL) 33
5.5 CONNECTING RAB / RAB RL TO THE PATIENT MONITOR 35

6 CONNECTORS 36

6.1 HOSPITAL ALARM SYSTEM CONNECTOR 37
6.2 RAB REMOTE LIGHT (RAB RL ONLY) CONNECTOR 39
6.3 RAB POWER SUPPLY (RAB RL ONLY) CONNECTOR 40
6.4 CABLING RAB RL INTERNAL 41

7 ASSEMBLY DRAWINGS 42

7.1 SPAREPARTS 43

1 INTRODUCTION

1.1 Manual Information

Scope of the Manual

The content of this field service manual is aimed primarily at biomedical equipment technicians and field service personnel. The user of this field service manual is expected to have a solid background in electronics, including strong backgrounds in analog and digital electronics, as well as microcomputer technology familiarity.

Revision History

Each page of this manual has a revision letter located at the bottom of the page. It identifies the revision level of the entire manual. This may be important if you have different manuals and you don't know which is the most current.
For the initial release, all pages have the revision letter A. For the second update, all pages receive the revision letter B. The latest letter of the alphabet added to the table below corresponds to the most current revision.

Revision History		
Revision	Date	Comment
A	04.05.2001	Initial release of this document

Manual Purpose

This field service manual has been prepared by the technical publications staff at GE Medical System - IT, Inc. It is intended for use by biomedical electronic technicians or other qualified service personnel responsible for installation, maintenance or repair of the RAB or RAB RL.

Chapter Content

The field service manual is organized into sections, as follows:

Introduction

Chapter one, "Introduction", describes the revision history, manufacturer responsibility, notes/cautions/warnings and abbreviations.

Equipment Overview

Chapter two, "Equipment Overview", describes the product, technical specifications, preparation for use and theory of operation.

Maintenance

Chapter three, "Maintenance", describes the maintenance schedule, visual inspection, cleaning the monitor, checkout procedures, leakage current tests and "Blink Mode speciality".

Troubleshooting
Chapter four, “Troubleshooting”, describes electro-static discharge, service mode and FAQ’s

Configuration
Chapter five, “Configuration”, describes jumper configurations, installing the Remote Alarm Box

Connectors
Chapter six, “Connectors”, describes pin assignment of the connectors.

Assembly Drawings
Chapter seven, “Assembly Drawings”, provides mechanical diagrams, reference diagrams, schematic diagrams and parts lists.

1.2 Safety Information

Responsibility of the Manufacturer

GE Medical Systems is responsible for the effects of safety, reliability, and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Medical Systems.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

Intended Use

This device is intended for use under the direct supervision of a licensed health care practitioner.
To ensure patient safety, use only parts and accessories manufactured or recommended by GE Medical Systems.
Contact GE Medical Systems for information before connecting any devices to this equipment that are not recommended in this manual.

Equipment Symbols

The following symbols appear on the equipment.

NOTE
Some symbols may not appear on all equipment.
ATTENTION: Consult accompanying documents before using the equipment.

Consult accompanying documents

AC voltage

DC voltage

LED indicator

Protection class II
(Caution the power supply unit for the alarm light of RAB RL is a protection class I device)

Notes, Cautions, and Warnings

The safety statements presented in this section apply to the components of the RAB and RAB RL Remote Alarm Box. Look for additional safety information throughout the rest of this manual.
The order in which safety statements are presented in no way implies order of importance.

The terms **WARNING**, **CAUTION**, and **NOTE** are used throughout this manual to point out hazards and to designate a degree or level or seriousness. Familiarize yourself with their definitions and significance. Hazard is defined as a source of potential injury to a person.

WARNING
indicates a potential hazard or unsafe practice which, if not avoided, could result in death or serious injury.

CAUTION
indicates a potential hazard or unsafe practice which, if not avoided, could result in minor personal injury or product/property damage.

NOTE
provides application tips or other useful information to assure that you get the most from your equipment.

1.3 Service Information

Service Requirements

Follow the service requirements listed below.

- Refer equipment servicing to GE Medical Systems authorized service personnel only.
- Any unauthorized attempt to repair equipment under warranty voids that warranty.
- It is the user's responsibility to report the need for service to GE Medical Systems or to one of their authorized agents.
- Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.
- Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required.

Equipment Identification

Every GE Medical Systems device has a unique serial number for identification.

Warranty

1 year

1.4 Terminology

RAB	**R**emote **A**larm **B**ox
RAB RL	**R**emote **A**larm **B**ox with **R**emote **L**ight
UTP CABLE	**U**nshielded **T**wisted **P**air Cable
PFD	**P**ower **F**ailure **D**etection Mode of RAB / RAB RL
PWA	**P**rinted **W**ire **A**ssembly
DMM	**D**igital **M**ulti **M**eter
GEMS-IT	**GE M**edical **S**ystems **I**nformation **T**echnologies

1.5 How to Reach Us

Service Calls and Product Support

To open a service call or obtain product support call the numbers below:

800.558.7044 (US &Canada)
561.575.5000 (outside US)

or contact your representative or distributor

For other product information please contact one of the offices listed on the next page.

Ordering Supplies &Service Parts

Order supplies (leadwires, electrode paste, thermal paper, etc.)or service parts (manuals, circuit boards, cables, software, etc.)from:

Accessories

GE Medical Systems Accessories and Supplies
2607 North Grandview Blvd.
Mail Code:SN-471
Waukesha,WI 53188

Telephone: 800.558.5102 (US only)
262.521.6856 (outside U.S.)
Fax: 800.232.2599 (US only)
262.521.6855 (outside US)

Service Parts

GE Clinical Services
P.O.Box 9100,100 Marquette Drive
Jupiter,FL 33468-9100

Telephone: 800.558.7044 (US only)
561.575.5000 (outside US)
Fax: 800.421.6841 (US only)
561.575.5050 (outside US)

Have the following information available before calling:

- part number of the defective part, or
- model and serial number of the equipment,
- part number/name of the assembly where the item is used,
- item name, and
- where applicable, reference designation (eg,R13,S12).

Ordering Manuals

When ordering additional operator manuals, be sure to include the software version of the product.

Other Questions or Problems

For additional information contact one of the offices listed below or see our website at www.gemedicalsystems.com

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8200 West Tower Avenue
Milwaukee,WI 53223,USA
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Fax: +65.277.7600

2 EQUIPMENT OVERVIEW

2.1 Product Description

Figure 2.1 Remote Alarm Box

Remote Alarm Box (RAB)

The Remote Alarm Box is a microprocessor controlled isolation relay (secondary alarm device).
It is used to connect the device listed below to the hospital alarm system:

- Dash patient monitors
- Dash Port Docking Station
- Solar 8000M patient monitor

Figure 2.2 Remote Alarm Box RAB RL

Remote Alarm Box with Remote Light (RAB RL)

The RAB RL is used to connect an alarm light (Remote Light, P/N 8500 AAX) to the devices listed above (secondary alarm light). This RAB RL does not connect to the hospital alarm system. A special, hospital grade power supply unit is required to supply power to the alarm light;
This unit is included in the shipment.

Both, RAB and RAB RL will function correctly only in conjunction with monitors with the software versions listed below:

Monitor	Software Version
Dash 2000	V3A or later
Dash 3000	V2B[1)] or later
Dash 4000	V2B[1)] or later
Solar8000M	V2A or later

[1)] not via Dash Port Docking Station

Table 2.1 RAB Software compatibility

2.2 LED Indicator Description

Figure 2.3 RAB LED Interface

Explanation of the LED Indicator

Indicator	Function
A, B, C	indicate the selected alarm mode: A : continuous mode B : intermittent mode C : blink mode
D	mode with power failure detection
E	lights up in alarm situation

Table 2.2 LED Indicator

2.3 Description of Operation

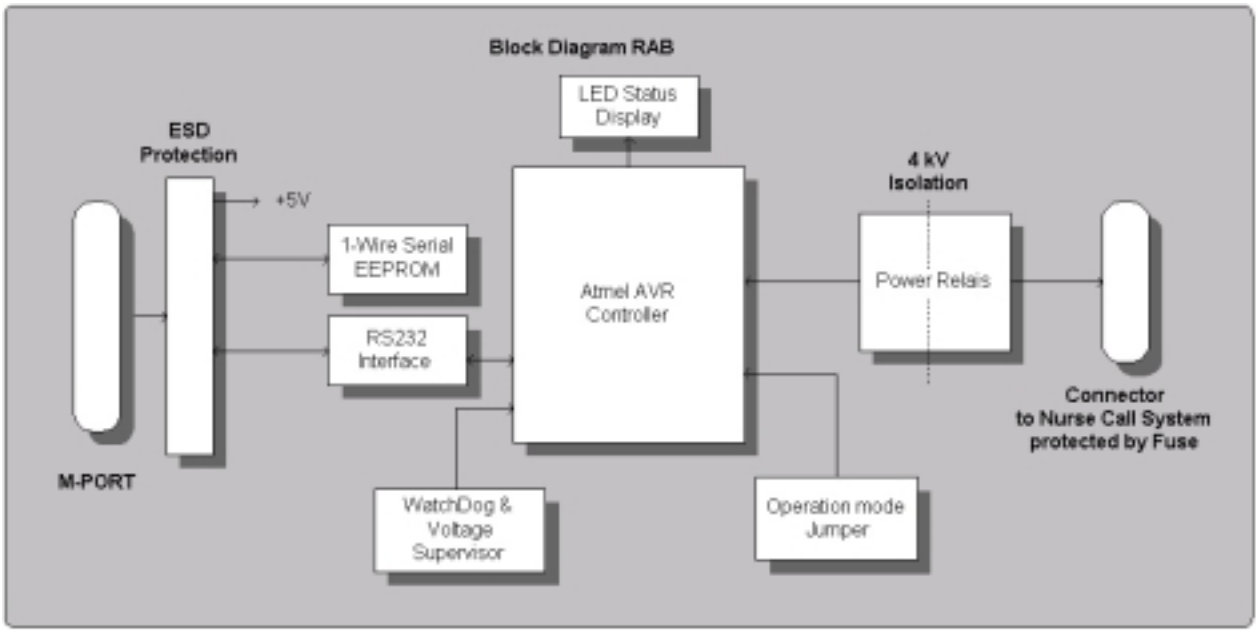

Figure 2.4 RAB Block Diagram

Block diagram of RAB :

The interface to the connected Patient Monitoring System is realized by a standard serial RS232 communication interface. So, in different to the existing Isolation Boxes („Nurse Call Boxes“) a small microprocessor is needed to realize the communication part of the box. The RAB / RAB RL operation mode could be configured by three configuration jumpers.
The µProcessor is requesting every 500ms the alarm status of the patient monitor via serial communication protocol. If the Monitor is in “ALARM”-state, the RAB / RAB RL toggles the alarm relay according to the configured alarm mode. If the Monitor is not in this state, the RAB / RAB RL switches the relay back (if it was in alarm state) or the relay remain the “non-alarm” position according to the configured operating mode.
After power up of the RAB / RAB RL there is a onetime switch delay of approx. 20 seconds to let the patient monitor startup to normal operation.
An independent hardware watchdog / power supervisor chip is provided to guarantee proper powerup/ powerdown and software behavior.
The configured device status and also the detected alarm status are displayed by 5 LED’s.
On Patient Monitor side the communication interface is realized as a M-Port interface with an 8-pin RJ-45 connector.
To connect the box to a hopsital alarm call system a 3 terminal screwing connector is provided and to connect the RL version of the RAB to the EAGLE Remote Light and external IEC601-1 power supply, a 9-pin SUB-D and a 3-pin power connector are used .

2.4 Specification Mechanical, Electrical

Mechanical Specification:

Size of the Housing : 114mm x 72mm x 45mm

Electrical Specification :

RAB / RAB RL

Operating Voltage	+5V (+-10%), max. 0.1A
Relay Switching Capacity	24V DC / 1A 250V AC / 1A *(Blink Mode : 24V DC / 24V AC, **0.1 A !**)*
Relay Isolation Voltage	4000V - RAB / RAB RL to Relay Output

3 MAINTENANCE

3.1 Maintenance Schedule

Manufacturer Recommendation

To make sure the RAB / RAB RL remains in proper operational and functional order, a good maintenance schedule must be adhered to.
The manufacturer's recommendations in this regard are as follows:

- **Visual Inspection**: These should be performed by qualified service personnel upon receipt of the equipment, every 12 months thereafter, and each time the monitor is serviced.
- **General Cleaning**: Service personnel should perform this after servicing the monitor.
- **Checkout Procedures**: These should be performed by qualified service personnel upon receipt of the equipment, every 12 months thereafter, and each time the monitor is serviced.
- **Leakage Current Tests**: These should be performed by qualified service personnel upon receipt of the equipment, every 12 months thereafter, and each time the monitor is serviced.
- **Maintenance "Blink Mode"** : If Blink mode is used a special maintenance must be performed by qualified service personnel every 12 months.

3.2 Visual Inspection

Inspecting the Monitor

The RAB / RAB RL should be carefully inspected.
Follow these guidelines when inspecting the equipment:

- Carefully inspect the RAB / RAB RL for obvious physical damage to the outer case. Do not use the RAB / RAB RL if physical damage is determined. Refer damaged equipment to qualified service personnel for repair before using it again on a patient.

- Inspect all external connectors, front and rear, for degraded pins, prongs and connector housings. Refer damaged equipment to qualified service personnel for repair before using it again on a patient.

- Inspect all cable insulation, cable strain-reliefs and cable connectors for damage, cracks or degradation. Refer damaged equipment to qualified service personnel for repair before using it again on a patient.
  For RAB RL check the fixing of the power cable at power supply and the RAB RL.

- Safety labels and inscriptions on the device are clearly legible.

3.3 General Cleaning

Clean External Surfaces

The exterior surfaces may be cleaned with a lint-free cloth dampened with one of these approved solutions:

- ammonia (diluted),
- Cidex,
- mild soap (dissolved), or
- sodium hypochlorite bleach (diluted).

3.4 Checkout Procedures

Checkout Procedures

The following pages contain the checkout procedures for the RAB / RAB RL. The purpose of the checkout procedures is to provide service personnel with a method which can be used to verify operational and functional performance of the RAB / RAB RL. Failure to attain any of the listed results indicates a potential malfunction of the RAB / RAB RL. Perform the checkout procedures upon receipt of the RAB / RAB RL, every twelve months thereafter, and each time the circuit board is removed or replaced. The checkout procedures are based on the assumption that the RAB / RAB RL being tested is used with known good cables and test equipment. It also requires that the user be somewhat familiar with the operation of all test equipment required for the checkout procedures. For more information concerning the operation of these components, refer to the respective **operator manual**.

Functional Test

It's recommended that the RAB / RAB RL will be checked connected to a complete system with DASH2000, DASH 3000, DASH4000 or SOLAR8000M as a bedside.

For the functional test switch the monitor to a "**NO Alarm**" state.

RAB / RAB RL Mode	**Relay**
Intermittent Mode with PFD	closed
Intermittent Mode	open
Continuous Mode with PFD	closed
Continuous Mode	open
Blink Mode with PFD	closed
Blink Mode	open
Test Mode for Service only	Open for 0.5 seconds and Closed for 0.5 seconds, periodical

Table 3.1 RAB Function Test

After this change the monitor to a “**Alarm** “ state.

RAB / RAB RL Mode	**Relay**
Intermittent Mode with PFD	Open for 100 seconds and Closed for 1 seconds, intermittent
Intermittent Mode	Closed for 100 seconds and Open for 1 seconds, intermittent
Continuous Mode with PFD	open
Continuous Mode	closed
Blink Mode with PFD	Open for 2 seconds and Closed for 2 seconds, intermittent
Blink Mode	Closed for 2 seconds and Open for 2 seconds, intermittent
Test Mode for Service only	Open for 0.5 seconds and Closed for 0.5 seconds, periodical

Table 3.2 RAB RL Function Test

3.5 Electrical Safety Test

General

Electrical safety test provide a method of determining potential electrical health hazards to the patient or operator of the device exist.

Recommendations

To help you establish a systematic maintenance routine, GEMS-IT recommends that you perform all safety tests presented in this chapter

- upon receipt of the device,
- every twelve months thereafter,
- each time the main enclosure is disassembled or a circuit board is removed, tested, repaired, or replaced, and
- record the date and results on the “Maintenance/Repair Log” included at the end of this chapter.

CAUTION
Failure to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards. Unless you have an Equipment Maintenance Contract, GE Medical Systems does not in any manner assume the responsibility for performing the recommended maintenance procedures. The sole responsibility rests with the individual or institution using the equipment. GEMS-IT service personnel may, at their discretion, follow the procedures provided in this manual as a guide during visits to the equipment site.

Test Conditions

Electrical safety tests may be performed under normal ambient conditions of temperature, humidity, and pressure.

Test Equipment

The manufacturer recommended test equipment required to perform electrical safety tests is listed below (see table 3.3). Equivalent equipment may be substituted as necessary.

Required Tools/Special Equipment
Leakage Current Tester 120 V 240 V (equivalent to the figures 3.1 - 3.2)
Multimeter 0 – 1000mV

Table 3.3 RAB Safety Test special Equipment

Wall Receptacle Test

Before starting the tests, the wall receptacle from which the monitoring device will get electrical power must be checked. This test checks the condition of the wall receptacle to ensure correct results from leakage tests. For international wall receptacles, refer to the internal standards agencies of that particular country. Use a digital multimeter to ensure the wall receptacle is wired properly. If other than normal polarity and ground is indicated, corrective action must be taken before proceeding. The results of the following tests will be meaningless unless a properly wired wall receptacle is used.

3.5.1 Ground (Earth) Wire Leakage Current Tests

This test needs to be performed only with RAB RL.

Perform this test to measure current leakage through the ground (earth) wire of the equipment during normal operation.

1. Set the leakage tester switches as follows:
   - GND switch - OPEN,
   - Polarity switch – NORM and RVS
   - Power switch - OFF.
2. Connect the DMM to the METER jacks on the leakage tester. Set the DMM to measure AC millivolts.
3. Connect the power cord of the device under test to the power receptacle on the rear of the leakage tester.

NOTE
The device under test is to be tested at its normal operating voltage.

4. Set the leakage tester power switch to ON.
5. Read the current leakage indicated on DMM. If the reading is greater than the appropriate specification below, the device under test fails and should be repaired and tested again.
   - 300 microamperes (0.3 volts on the DMM), and the device under test is powered from 100 - 120 V / 50 - 60 Hz
   - 300 µA (0.3 volts on the DMM), and the device under test is powered from a centered-tapped 200 - 240 V / 50 - 60 Hz, single- phase circuit
   - 500 µA (0.5 volts on the DMM), and the device under test is powered from a non-center-tapped, 200 - 240 V / 50 - 60 Hz, single-phase circuit

NOTE
Center-tapped and non-center-tapped circuits produce different leakage currents and the UL and IEC limits are different.

6. Set the leakage tester power switch to OFF.

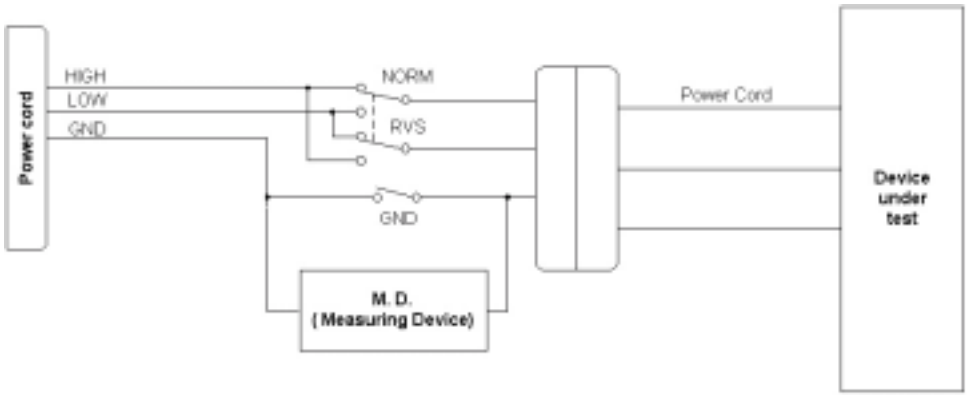

Figure 3.1 RAB Ground (Earth) Wire Leakage Current Tests

NOTES
The MD (measuring device) is the circuitry defined by the appropriate standard for measuring leakage current. The measuring devices, defined by various standard organizations (IEC, UL, etc.), produce almost identical test measurement results.

3.5.2 Enclosure Leakage Current Test

This test needs to be performed only with RAB RL.

Perform this test to measure current leakage through exposed conductive surfaces on the device under test during normal operation.

1. Set the leakage tester switches as follows:
   - GND switch - OPEN,
   - Polarity switch – NORM
2. Connect a meter lead between the GND of the tester accordingly to the circuit and the metal housing of the RL connector and one of the metal screws of the remote light..
3. Set the leakage tester power switch to ON.
4. Read the current leakage indicated on DMM. If the reading is greater than the appropriate specification below, the device under test fails and should be repaired and tested again.
   - 300 microamperes (0.3 volts on the DMM), and the device under test is powered from 100 - 120 V / 50 - 60 Hz
   - 300 µA (0.3 volts on the DMM), and the device under test is powered from a centered-tapped 200 - 240 V / 50 - 60 Hz, single phase circuit
   - 500 µA (0.5 volts on the DMM), and the device under test is powered from a non-center-tapped, 200 - 240 V / 50 - 60 Hz, single-phase circuit

NOTE
Center-tapped and non-center-tapped circuits produce different leakage currents and the UL and IEC limits are different.

5. Set the polarity switch to RVS and observe the same meter readings as in the previous step.
6. Set the GND switch on the leakage tester to CLOSED.
7. Read the current leakage indicated on DMM. If the reading is greater than the appropriate specification below, and the device under test is powered from 100-240 V/50-60 Hz, the device under test fails and should be repaired and tested again.
   - 100 microamperes (0.1 volts on the DMM), and the device under test is powered from 100-240 V/50-60 Hz
8. Set the polarity switch to RVS and observe the same meter readings as in the previous step.

9. Set the leakage tester power switch to OFF and remove the meter lead connected in step 2.

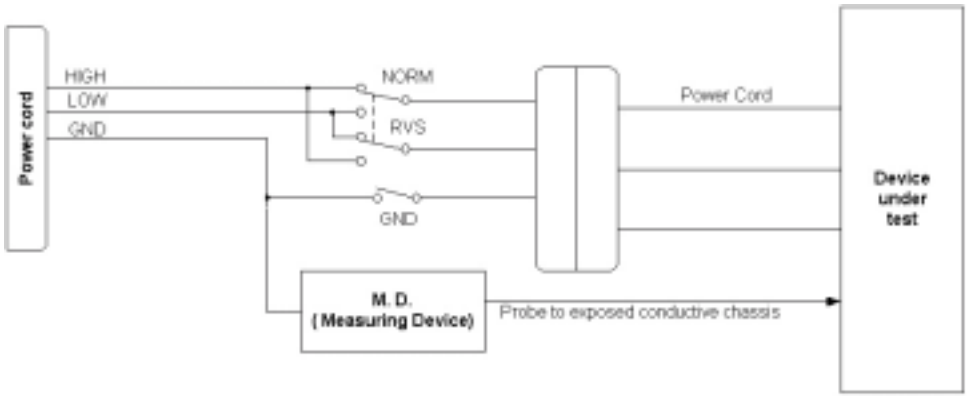

Figure 3.2 Enclosure Leakage Current Test

Test Completion

Disconnect all test equipment from the device. Disconnect the device power cord plug from the leakage tester power receptacle. Disconnect the leakage tester from the wall receptacle.

3.6 Maintenance Blink Mode

Due of the maximum switching cycle of the relay contacts there is a reduced relais life time in Blink Mode. If the Blink mode is used, the PWA **must** be replaced every 12 months.

4 TROUBLESHOOTING

4.1 Electrostatic Discharge (ESD)

CMOS Components

The monitor makes extensive use of CMOS components because they are more immune to noise and consume less power than standard TTL or NMOS components. However, CMOS components are inherently more susceptible to electrostatic discharge (ESD) damage than other types of semiconductor materials. ESD damage, causing a weakening or complete breakdown of p-n junctions within multilayer semiconductor substrates, can range from slight degradation to catastrophic failure. Slight degradation usually results in intermittent failure of the affected component catastrophic failure results in rendering the affected component permanently unusable. Although CMOS components may be more sensitive to ESD, all semiconductor devices are susceptible to ESD damage. All external connector inputs and outputs of the monitor are designed with protection from ESD damage. However, if the monitor requires service, exposed components and assemblies contained within are susceptible to ESD damage. This includes human hands, non-ESD protected work stations and/or improperly grounded test equipment. The following guidelines help make a service workstation more resistant to the ESD damage:

- Discharge any static charge you may have built up before handling semiconductors or assemblies containing semiconductors.
- A grounded, antistatic wristband (3M part number 2046 or equivalent) or heel strap should be worn *at all times* while handling or repairing assemblies containing semiconductors.
- Use properly grounded soldering and test equipment.
- Use a static-free work surface (3M part number 8210 or equivalent) while handling or working on assemblies containing semiconductors.
- **Do not** remove semiconductors or assemblies containing semiconductors from antistatic containers (Velo-stat bags) until absolutely necessary.
- Make sure power to an assembly is turned off before removing or inserting a semiconductor.
- **Do not** slide semiconductors or electrical/electronic assemblies across any surface.
- **Do not** touch semiconductor leads unless absolutely necessary.
- Semiconductors and electrical/electronic assemblies should be stored only in antistatic bags or boxes. These guidelines may not guaranty a 100% static-free workstation, but can greatly reduce the potential for failure of any electrical/electronic assemblies being served.

4.2 RAB / RAB RL for your Safety

Before opening the RAB, please disconnect the cable to the hospital alarm system from the wall inlet to prevent the risk of higher voltage inside the RAB.

For RAB RL also disconnect the power supply cable before opening the RAB RL.

After configuration of the device to the alarm mode used in the specific hospital and closing / mounting of the device, always a functional test of the complete alarm path *(Patient Monitor -> RAB / RAB RL -> Hospital Alarm System / Remote Alarm Light with external power supply)* must be performed!

4.3 Service Mode RAB / RAB RL

For a functional control of the RAB / RAB RL installation without using a Patient Monitor, a special service mode is implemented. After open the RAB / RAB RL box please configure the configuration jumpers to SERVICE MODE (J1:2-3, J2:2-3, J3:2-3). Please remember the original settings of the jumpers to reconfigure the device to the original settings.

This mode is only for service purposes. It will toggle the relay output every half second. This mode toggles also LED E every half second from ON to OFF and vice versa . It helps to ensure the functionality of the RAB / RAB RL microprocessor system , the relay output and the connected hospital alarm system / remote alarm light.

NOTE
When in working in this mode there will be no failure detection or alarm processing! Using this mode there will be no test of the alarm communication path from the patient monitor to the RAB / RAB RL! (Patient Monitor, cable, RAB / RAB RL communication interface are not tested).

NOTE
After reconfiguration of the device to the alarm mode used in the specific hospital and closing / mounting of the device, always a functional test of the complete alarm path must be performed!

4.4 Troubleshooting FAQ's

This section covers (when not specifically mentioned) both devices, RAB and RAB RL

No reaction of the RAB / RAB RL after power up

If the RAB / RAB RL will not react on connecting it to a patient monitor / docking station there could be the following listed reasons for this behavior: When used with DASH / DASH PORT docking station a AUX-Port to M-Port Adapter must be used at patient monitor / DASH PORT docking station side. When used with SOLAR8000M, no adapter must be used. Cable to patient monitor could be defective or has no contact to the patient monitor / docking station connector or the RAB / RAB RL connector AUX-Port to M-Port Adapter could be defective or has no contact At patient monitor side, cable is plugged into wrong connector (DASH -> Ethernet) or the RAB could be defective. *Please replace the RAB / RAB.*
Patient Monitor's or Docking Station's M-port / AUX-Port has a defect.

After power up, not all LED's are flashing ON for a short time

After powering the device, all five LED's must flash ON for nearly a second. This is a visual control of the LED's circuits functionality. If this error occurs, LED, LED transistor or specific microcontroller output could have a malfunction. *Please replace the RAB / RAB.*

Error detected, all five LED's are blinking

There are several tests done by the internal microprocessor during startup and normal operation of the device. Because all tests check functional critical parts of the device, a detected error means that the correct functionality of the device can not be guaranteed. *Please replace the RAB / RAB.*

RAB / RAB RL works normal, but no relay toggle / LED "E" ON when alarm

There can be the following listed reasons for this behavior: Cable to patient monitor / docking station or AUX-Port to M-Port adapter is defective or RAB is defective *Please replace the RAB / RAB.* Patient Monitor's or Docking Station's M-port / AUX-Port has a defect.

RAB / RAB RL works normal, also in alarm state, but no reaction of Alarm System*:*

Check complete cabling to the hospital Alarm System Check hospital Alarm System functionality
Check the fuse inside the RAB. If the fuse was burned, *please replace the RAB.* Check the functionality of the RAB relay. To do this, disconnect the RAB from the Alarm System and use an Ohm Meter to check the correct functionality of the relay. If the relay / LED E will not work properly, *please replace the RAB.*

RAB RL:
Check the 12 VDC of the medical power supply. *If the power supply is defective, please replace it.* Check the wiring inside the RAB RL for broken connections. When the power supply is connected to the RAB RL, verify the voltages at the RAB RL remote light connector. (See 4.3.3 pinning). If the voltages are OK (also when in alarm state -> +12VDC on pin ALARM) and the remote light will not work, *please replace the alarm light*. Check the fuse inside the RAB. If the fuse was burned, *please replace the RAB RL.* This should never happen, if it will, also the power supply and the remote light will surely be defective. Check the functionality of the RAB relay. To do this, disconnect the RAB RL from the Alarm System and use an Ohm Meter to check the correct functionality of the relay. If the relay / LED E will not work properly, *please replace the RAB RL.*

5 CONFIGURATION

5.1 CONFIGURATION Jumper

Alarm Mode Configuration (RAB / RAB RL)

J1	J2	J3	Alarm Mode
2-1	2-1	2-1	intermittent, 100s, with power failure detection
2-1	2-1	3-2	intermittent, 100s
2-1	3-2	2-1	continuous, with power failure detection
2-1	3-2	3-2	continuous
3-2	2-1	2-1	blink mode, 2s, with power failure detection
3-2	2-1	3-2	blink mode, 2s
3-2	3-2	3-2	testmode / service mode

Table 5.1 Alarm Mode Jumper

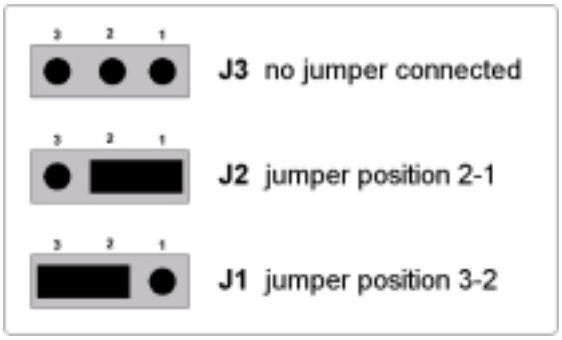

Figure 5.1 Jumper Description (Example)

The factory default setting for the alarm mode is the “Intermittent Mode (100 seconds) with Power Failure Detection”. If your application requires a different alarm mode, configure this mode as follows before connecting the RAB / RAB RL.

- Remove the 4 screws on the underside of the housing.
- Take off the upper part of the housing.

You will see the three jumpers J 1, J 2 and J 3 on the PWA. The jumper configuration determines the alarm mode (Figure 5.1). Upon delivery, all three jumpers are in position 1-2 (intermittent mode – 100 seconds, with power failure detection). Refer to Table 5.1 for all possible jumper configurations.

5.2 Connecting the Cable to the Hospital Alarm System

Warning
Patient Safety — Choose cables and connectors with the appropriate voltage and current carrying capacity.

Note
When operating the hospital alarm system in the current monitoring mode, please connect the cables appropriately.

- Loosen the screw of the cable collar on the PWA.
- Guide the cable through the sleeve.
- Connect the cable to the relay contacts as required for the configured alarm mode:
  - terminals REL 2 and REL 3: break contact
    (open when relay attracts)
  - terminals REL 1 and REL 2: make contact
    (closed when relay attracts)
- Secure the cable with the collar. To ensure that thin cables are securely held in place by the cable collar, wrap them in insulating tape or reinforce them with shrink-down tubing.
- Place the upper part of the housing on the lower part, checking the correct position of the optical light guides.
- Screw tight the four screws on the underside of the housing.

5.3 Connecting the Alarm Light (RAB RL)

The factory default wiring of the alarm light connector (**1**, Figure 5.2) is for an alarm mode with power failure detection, i.e., when the relay is released, the light is on. To select a mode without power failure detection, change the wiring internally as follows:

Figure 5.2 Connecting RAB RL

- Open the housing and disconnect the cable to terminal REL 3 and connect it to terminal REL 1.
- Close the housing.
- Connect the alarm light to connection (**1,** Figure 5.2).

  Secure the connection with the screws provided on the plug.

5.4 Connecting the Power Supply Unit (RAB RL)

Note
You can install the power supply unit either by means of a Velcro strip attached to the back side of the support, or mount it to a GCX system. When using a GCX system, the appropriate fixation elements must be mounted on the support before the power supply unit can be inserted in the support.

- Remove the upper part of the cable collar **(6**, Figure 5.3).
- Plug the power supply cable into the socket **(5**, Figure 5.3).
- Place the cable in the lower part of the cable collar **(6**, Figure 5.3) and screw tight the upper part of the collar to secure the able.
- Insert the power supply unit (the legs pointing down) in the support **(7** Figure 5.4).
- Screw the bracket with the cable collar on to the support **(8** Figure 5.5).
- Remove the upper part of the cable collar (**9** Figure 5.5). Connect the lower cord to the power supply unit.
- Place the power cord in the lower part of the cable collar and screw tight the upper part of the collar to secure the cable (**10**, Figure 5.6).
- Connect the power supply unit to the power line.

Figure 5.3 RAB RL connecting power supply

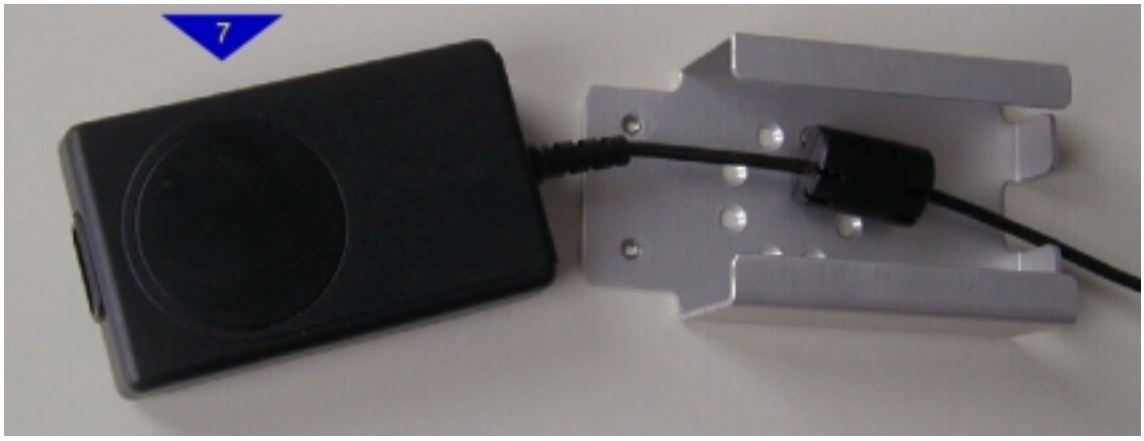

Figure 5.4 a) RAB RL mounting the power supply

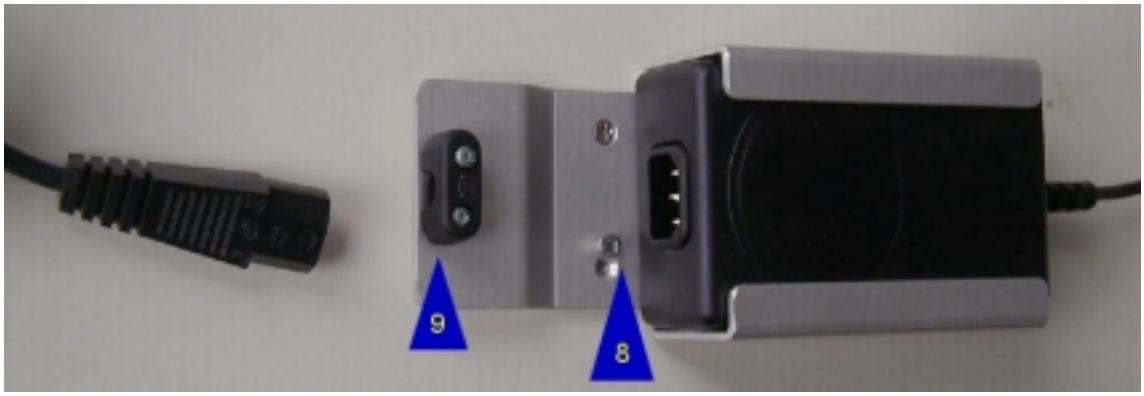

Figure 5.5 b) RAB RL mounting the power supply

Figure 5.6 c) RAB RL mounting the power supply

5.5 Connecting RAB / RAB RL to the Patient Monitor

Caution
Patient Safety — Only the GEMS IT supplied UTP cable or an equivalent cable may be used to connect the device to the patient monitor. Observe the following points to ensure correct functioning of the RAB / RAB RL: unshielded, twisted-pair cable, 8-pole, max. length 5 m, min. AWG 26, gold-plated contacts; do not use X-cables.

- Plug the supplied UTP cable into socket.To do so, push the plug into the socket until you hear it click into place. Briefly pull on the cable to check that the connection is secure. When connecting the device to a Dash patient monitor or to a Dash Port Docking Station, the adapter ADPTR AUTOPORT M-PORT (2001973-001) must be connected to the AUX port of the monitor / Dash Port Docking Station first (Figures 5.7).

  When connecting the device to a SOLAR 8000M patient monitor, the cable is directly plugged into one of the M-PORT sockets (Figures 5.8).

- Connect the cable as shown in Figures 5.7 and 5.8. Ensure that the connector(s) engage properly.

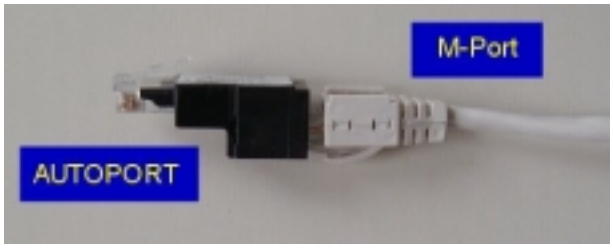

Figure 5.7 RAB M-Port to Autoport Adapter

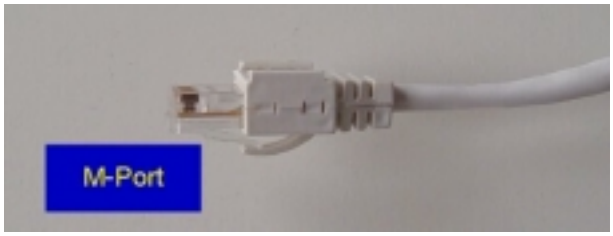

Figure 5.8 RAB M-Port UPT cable

6 Connectors

General

The connector to the Patient Monitor is directly M-Port compatible, so the RAB could be connected directly to a SOLAR8000M patient monitor.

To connect the RAB to a DASH patient monitor, the Autoport adapter PN 2001973-001, Rev.B or newer must be used.

Monitor Connector RJ-45

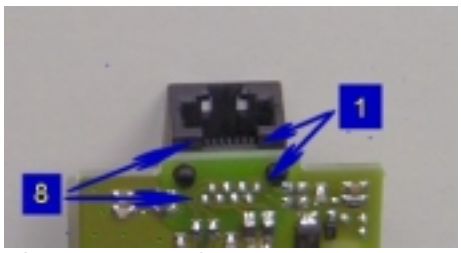

Figure 6.1 RAB / RAB RL RJ-45 Connector

Pinning:

PIN No.	Label	Direction/ Power	Description
1	ETH1	N.a.	M-Port Signal, not used
2	ETH2	N.a.	M-Port Signal, not used
3	SID	I/O	Serial Identification Pin, 1-Wire Protocol
4	M_PORT_GND	Power	Ground return line
5	TXD	Output	RS 232 Transmit line
6	SID_RETURN	Power	Serial Identification, Ground return line
7	RXD	Input	RS232 Receive line
8	M_PORT_VCC	Power	+5V Power Input

Table 6.1 RAB / RAB RL RJ-45 Connector

Input Data

SID Input signal to communicate from Patient Monitor (e.g. with M-Port, like SOLAR8000M) with the DS2430A E²PROM to determine Serial ID number.

RXD Input signal to get patient monitor alarm status via RS232 communication

Output Data

TXD Output signal to request patient monitor alarm status via RS232 communication.

ETH1,ETH2 M-Port Ethernet differential lines, not connected, not used

Power Signal

M_PORT_VCC Power input signal (5V)

M_PORT_GND Power Ground

SID_RETURN Power Ground signal from Patient Monitor (e.g. with M-Port, like SOLAR8000M) to determine Serial ID number

6.1 Hospital Alarm System Connector

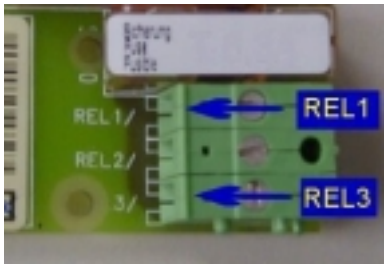

Figure 6.2 RAB Hospital Alarm System Connector

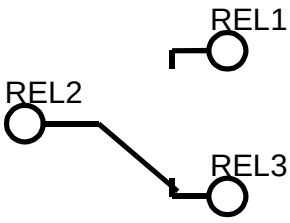

Figure 6.3 RAB Hospital Alarm System Connector - Schematic

REL1 Contact to be connected with REL2 if relay current is switched on

REL2 Middle contact of the relay

REL3 Contact to be connected with REL2 if relay is not powered

How to connect the cable to Hospital Alarm System

- Loosen the screw of the cable collar on the PWA.
- Guide the cable through the sleeve.
- Connect the cable to the relay contacts as required for the configured alarm mode:
  - terminals REL 2 and REL 3: break contact (open when relay activates)
  - terminals REL 1 and REL 2: make contact (closed when relay activates)
- Secure the cable with the collar. To ensure that thin cables are securely held in place by the cable collar, wrap them in insulating tape or reinforce them with shrink-down tubing.
- Place the upper part of the housing on the lower part, checking the correct position of the optical light guides.
- Screw tight the four screws on the underside of the housing.

Warning
Patient Safety — Choose cables and connectors with the appropriate voltage and current carrying capacity.

Note
The RAB can be connected to the hospital alarm system in different ways, depending on whether or not the power failure detection mode is configured and whether or not the hospital alarm system is using the current monitoring mode.

Power failure detection mode ENABLED
- hospital alarm system using current monitoring mode: connect terminals REL 1 and REL 2 (break contact when power off/alarm)
- hospital alarm system not using current monitoring mode: connect terminals REL 2 and REL 3 (make contact when power off/alarm)

Power failure detection mode DISABLED
- hospital alarm system using current monitoring mode: connect terminals REL 2 and REL 3 (break contact when alarm)
- hospital alarm system not using current monitoring mode: connect terminals REL 1 and REL 2 (make contact when alarm)

6.2 RAB Remote Light (RAB RL only) Connector

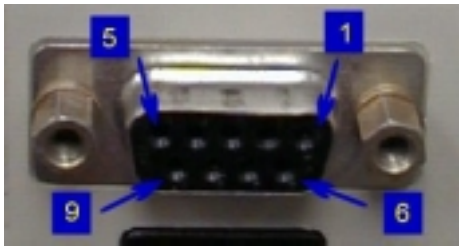

Figure 6.4 RAB RL Remote Light Connector

A 9 pin Sub-D connector to connect the EAGLE Remote Light 8500AAX to the RAB RL

Pinning of the 9-pin Sub-D connector:

PIN number	Label	Direction/ Power	Description
1	VS	Power Output	+12 VDC
2	-	-	not connected
3	-	-	not connected
4	-	-	not connected
5	-	-	not connected
6	-	-	not connected
7	COM	Power Output	Ground
8	ALARM	Signal Output	+12V: Alarm NC/Ground: No Alarm
9	-	-	not connected
Shield	Shield	-	connected to Alarm Light shield not connected to RAB RL, no other electrical connection

Table 6.2 RAB RL Remote Light Connector

Output Data

VS +12VDC to EAGLE Remote Light 8500AAX
COM Ground signal to EAGLE Remote Light 8500AAX
Alarm Alarm signal to EAGLE Remote Light 8500AAX

6.3 RAB Power Supply (RAB RL only) Connector

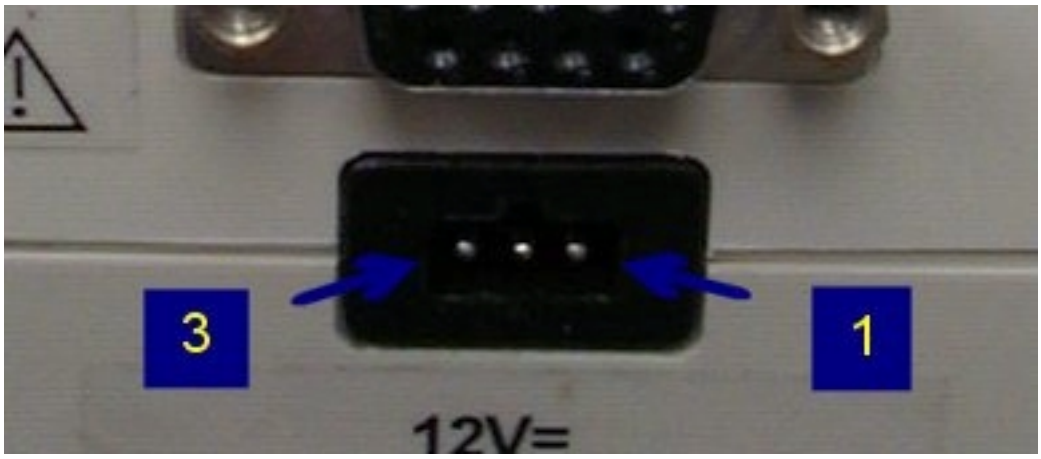

Figure 6.5 RAB RL Power Supply Connector

3-pin male connector for the 12VDC Medical Power supply 2000300-001

Pinning of the 3-pin Power connector:

PIN number	Label	Direction/ Power	Description
1	+12VDC	Power Input	
2	GND	Power Input	
3	-	-	not connected

Table 6.3 RAB RL Power Supply Connector

Input & Power Data

VCC +12VDC from external medical power supply

GND GND from external medical power supply

6.4 Cabling RAB RL internal

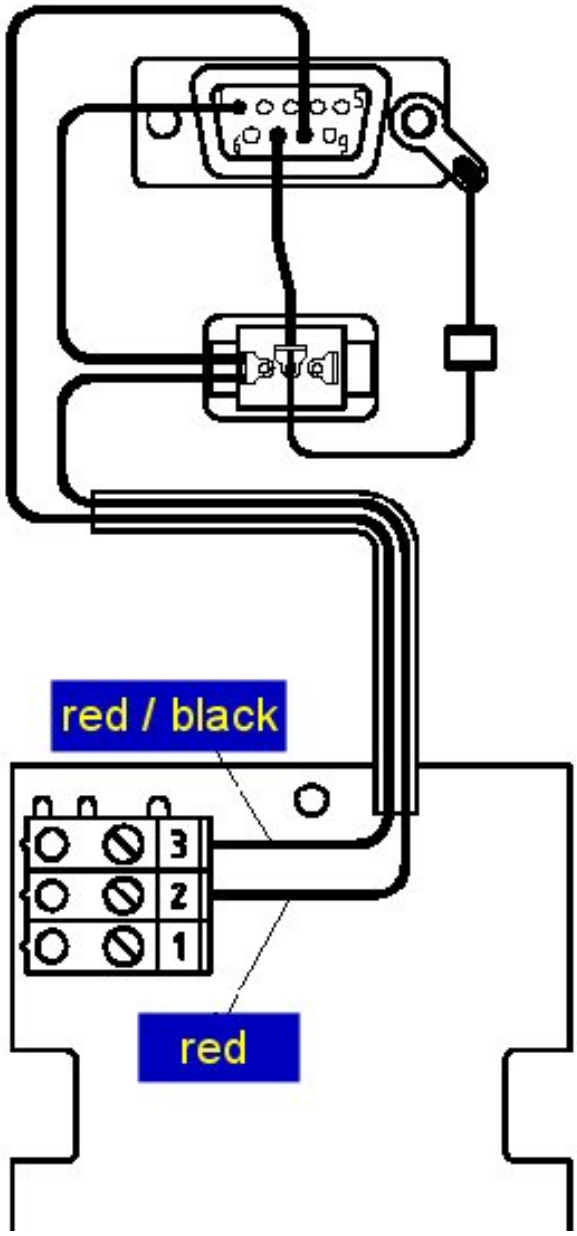

Figure 6.6 RAB RL cabling

Wire 1 (red) is to be connected to **REL2** and

Wire 2 (red/black) is to be connected according to the selected alarm mode:

- **REL3** when operating with power failure detection (default mode) **or**
- **REL1** when operating without power failure detection

7 ASSEMBLY DRAWINGS

Introduction

Included in this section is a complete set of mechanical diagrams, Reference diagram and schematic diagrams.

Spare Part List - These list shows the complete parts for service use.

Mechanical diagrams - These diagrams shows the mechanical assembly of RAB and RAB RL

Reference diagrams - These diagrams shows provide a reference and view of the used components in the schematic.

Schematic diagrams - These diagrams shows the electrical wired connections between the used analog and digital electronics components.

7.1 Spareparts

Electronic Parts

Part Description	Detailed Part Description	Part No.
Remote Alarm Box	Remote Alarm Box RAB (RAB Box including Printed Circuit Board)	2005693-001
Remote Alarm Box Remote Light	Remote Alarm Box Remote Light (RAB RL Box including Printed Circuit Board)	2005693-006
Spare PCB. Remote Alarm Box	Spare PCB. Remote Alarm Box for RAB and RAB RL Alarm Boxes (High Pot tested)	2007067-001
Power Supply	Power Supply SW172 (12V)	2000300-001
Assembly Remote Light	Assembly Remote Light for RAB RL Box	8500AAX
Fuse	Fuse for Relay circuit 3.15A Slow Blow	91208440

Mechanical Parts

Part Description	Detailed Part Description	Part No.
Optical Light Guide	Optical Light Pipe for RAB, RAB RL	2005478-001
Cable clamp	Cable clamp for RAB	91614100
Plastic nozzle	Plastic nozzle for cable of RAB	42103273
Cable clamp	Cable clamp for RAB RL	91618976
Bottom plate	Bottom plate metal for RAB RL	2006575-001
Adapter plate	Adapter plate metal for GCX mounting.	2006576-001
Holder for Power Supply	Metal Holder for Power Supply SW172	2006574-001
Bracket	Metal Bracket for Power Supply Holder	2006573-001

Cables and Connectors

Part Description	Detailed Part Description	Part No.
Adapter Autoport to M-Port	Adapter Autoport to M-Port	2001973-001
Cable Assembly RJ45 5ft	Cable Assembly RJ45 to bedsides 5ft	418335-001
Cable cord 2 wire	Cable cord 2 wire (has to be ordered in meter)	91906200

The following Power Cords are only used for RAB/RL units

Detailed Part Description	Part No.
PWR CORD 10A 8FT CONT EURO STR	401855-101
PWR CORD 10A 8FT BRITISH STR	401855-102
PWR CORD ITALIAN 10A 8FT STR	401855-103
PWR CORD ISRAELI 10A 8FT STR	401855-104
PWR CORD SWISS 10A 8FT STR	401855-107
PWR CORD INDIAN 10A 8FT STR	401855-108
PWR CORD DANISH 10A 8FT STR	401855-109
PWR CORD AUSTALIAN 10A 8FT STR	401855-110
PWR CORD 125V 6FT STR (United States)	80274-006

Operation and Service Manuals

Part Description	Detailed Part Description	Part No.
Operation Manual GER	Operation Manual German language	2006406-001
Operation Manual ENG	Operation Manual English language	2006406-002
Operation Manual FRE	Operation Manual French language	2006406-003
Operation Manual ITA	Operation Manual Italian language	2006406-004
Operation Manual SPA	Operation Manual Spanish language	2006406-005
Operation Manual DUT	Operation Manual Dutch language	2006406-006
Operation Manual SWE	Operation Manual Swedish language	2006406-007
Operation Manual RUS	Operation Manual Russian language	2006406-009
Operation Manual POL	Operation Manual Polish language	2006406-011
Operation Manual JAP	Operation Manual Japanese language	2006406-012
Operation Manual POR	Operation Manual Portuguese language	2006406-013
Operation Manual NOR	Operation Manual Norwegian language	2006406-014
Operation Manual DAN	Operation Manual Danish language	2006406-015
Operation Manual CHI	Operation Manual Chinese language	2006406-016
Operation Manual HUN	Operation Manual Hungarian language	2006406-017
Service Manual	Service Manual	2006406-010

Following sheets are attached:

2004577-001	SCHEM INTFC NURSE CALL
2004576-002	DOC REF DWG INTFC NURSE CALL 1
2004576-003	DOC REF DWG INTFC NURSE CALL 2

RAB :

2005693-002	DOC MECH DWG ZM01

RAB RL:

2005693-007	DOC MECH DWG ZM01
2005693-008	DOC SCHEM SZ01

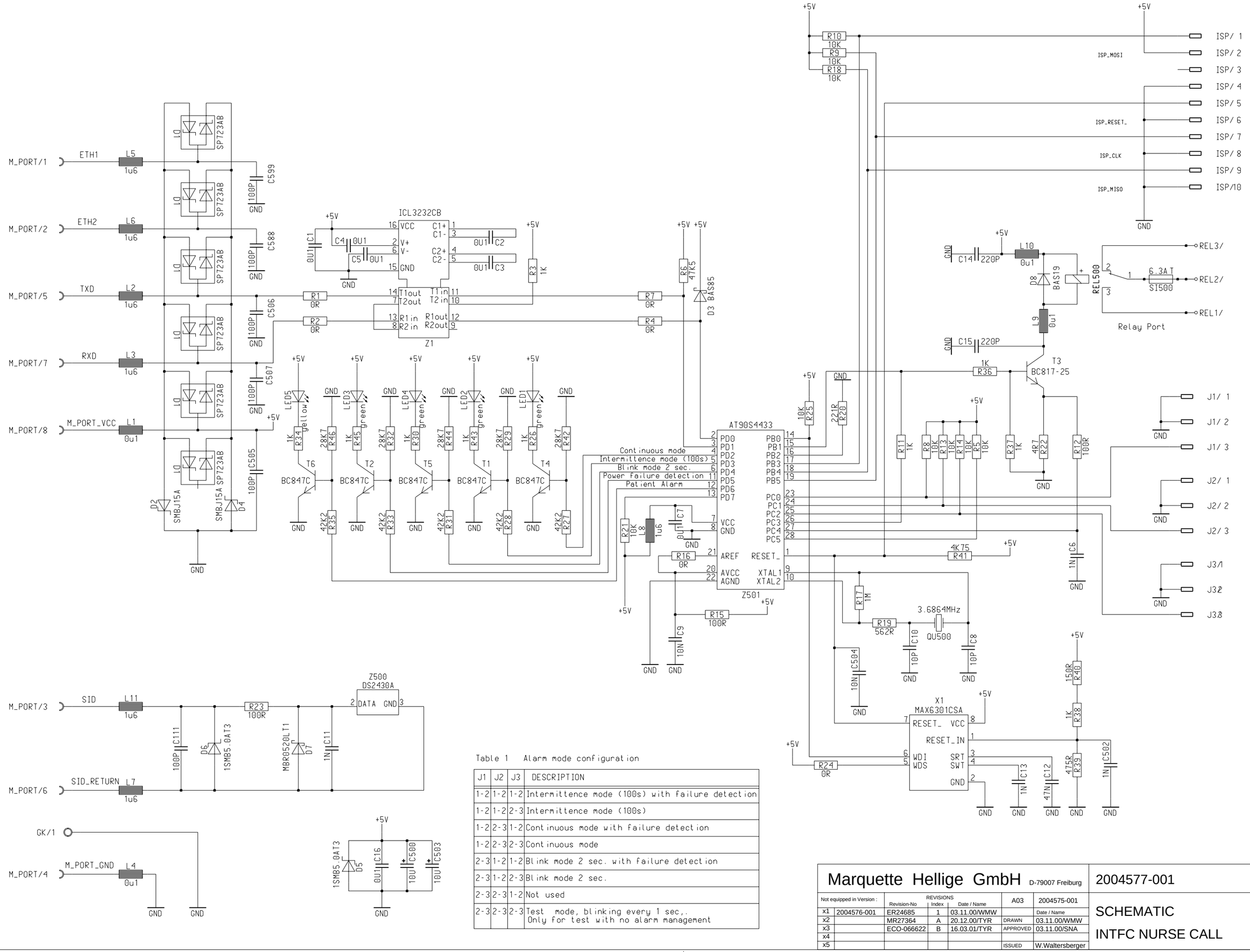

Table 1 Alarm mode configuration

J1	J2	J3	DESCRIPTION
1-2	1-2	1-2	Intermittence mode (100s) with failure detection
1-2	1-2	2-3	Intermittence mode (100s)
1-2	2-3	1-2	Continuous mode with failure detection
1-2	2-3	2-3	Continuous mode
2-3	1-2	1-2	Blink mode 2 sec. with failure detection
2-3	1-2	2-3	Blink mode 2 sec.
2-3	2-3	1-2	Not used
2-3	2-3	2-3	Test mode, blinking every 1 sec., Only for test with no alarm management

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2004577-001

Sheet: 1 of 1

Not equipped in Version :		REVISIONS Revision-No	Index	Date / Name	A03	2004575-001
x1	2004576-001	ER24685	1	03.11.00/WMW		Date / Name
x2		MR27364	A	20.12.00/TYR	DRAWN	03.11.00/WMW
x3		ECO-066622	B	16.03.01/TYR	APPROVED	03.11.00/SNA
x4						
x5					ISSUED	W.Waltersberger

SCHEMATIC

INTFC NURSE CALL

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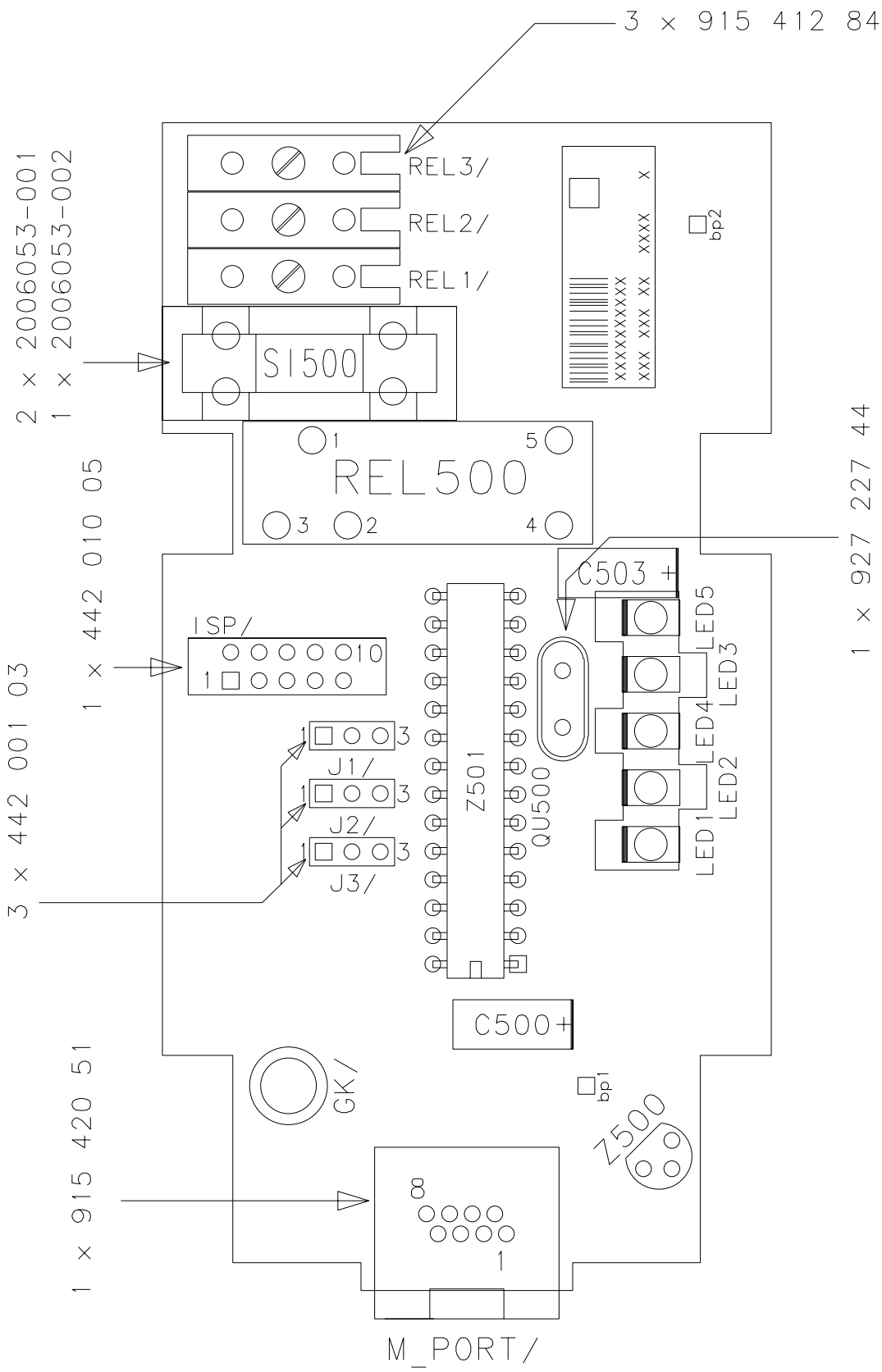

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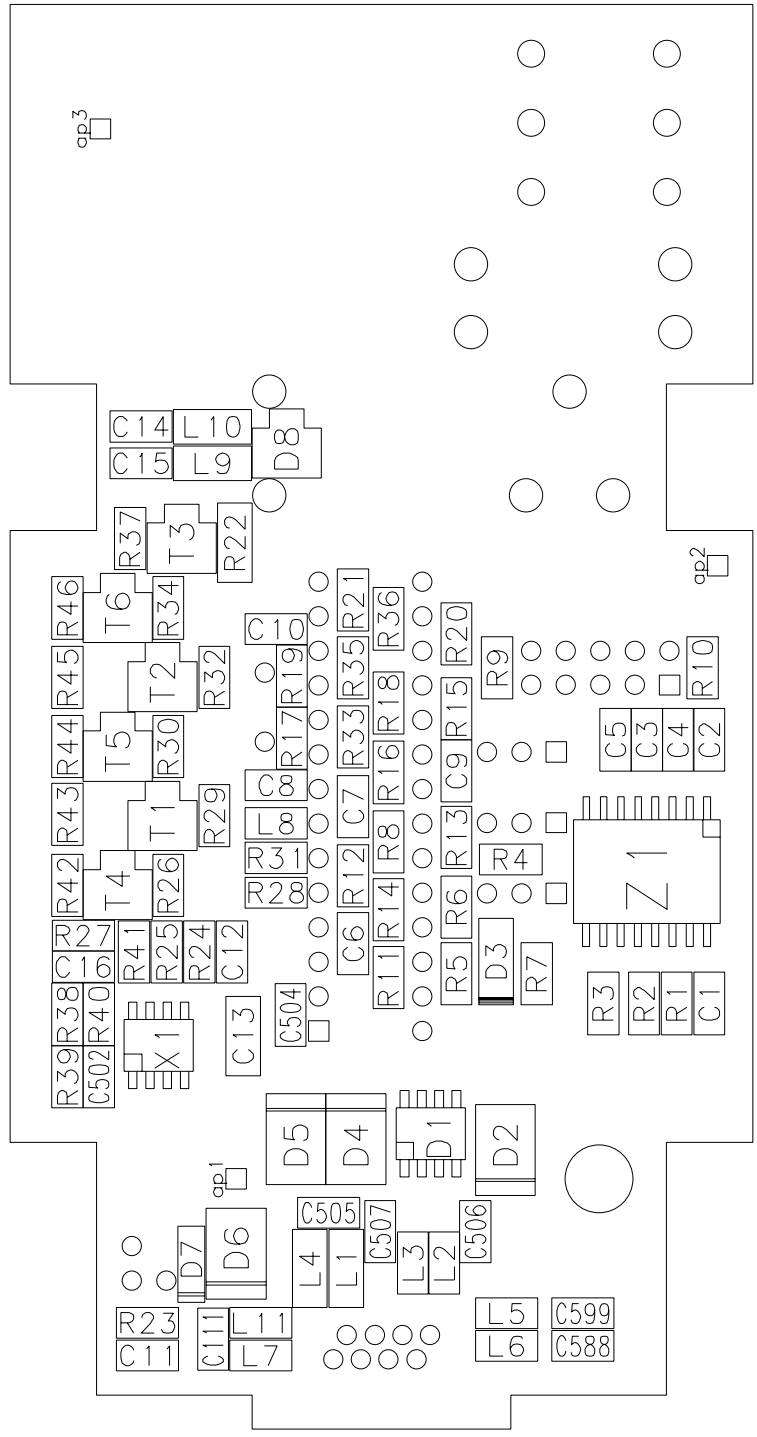
Revision-No	Index	Date/Name		Date/Name
ER24685	1	27.09.00/MSG		
MR27364	A	20.12.00/TYR	Drawn	27.09.00/MSG
066622	B	23.03.01/MSG	Approved	27.09.00/WMW
			Issued	M. Gutmann

REF DWG
INTFC NURSE CALL

WAVE

Schutzvermerk nach DIN 34 beachten.

GLUING



Marquette Hellige GmbH D-79007 Freiburg				2004576-003 2 / 2
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Revision-No	Index	Date/Name		2004575-001
ER24685	1	27.09.00/MSG		Date/Name
MR27364	A	20.12.00/TYR	Drawn	27.09.00/MSG
066622	B	23.03.01/MSG	Approved	27.09.00/WMW
			Issued	M. Gutmann

REF DWG

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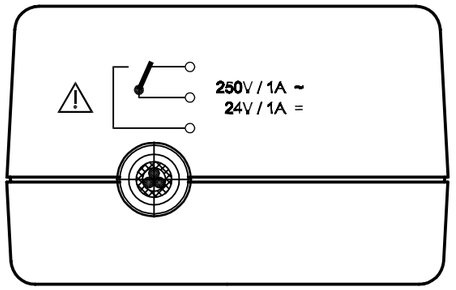
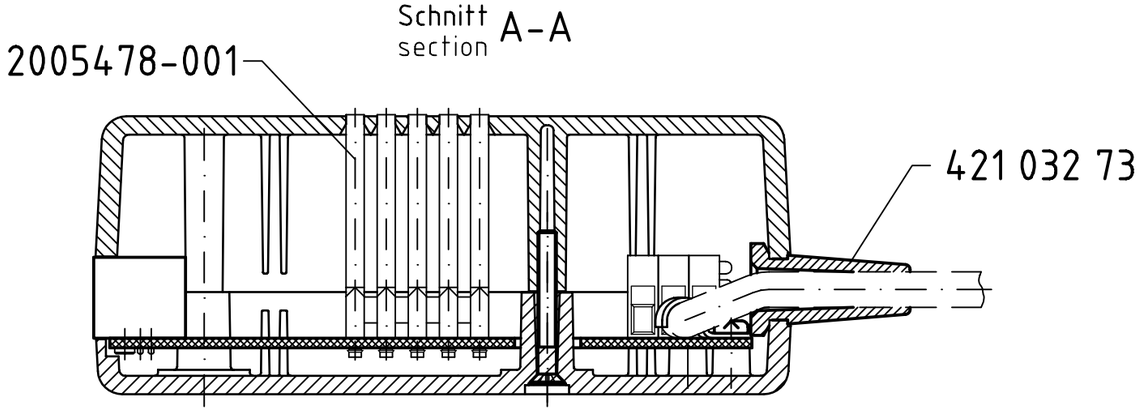
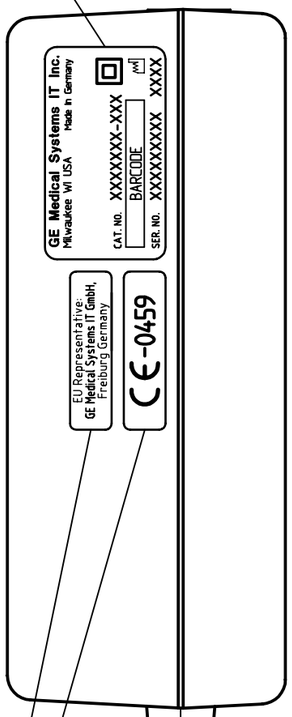


Schnitt A-A
section

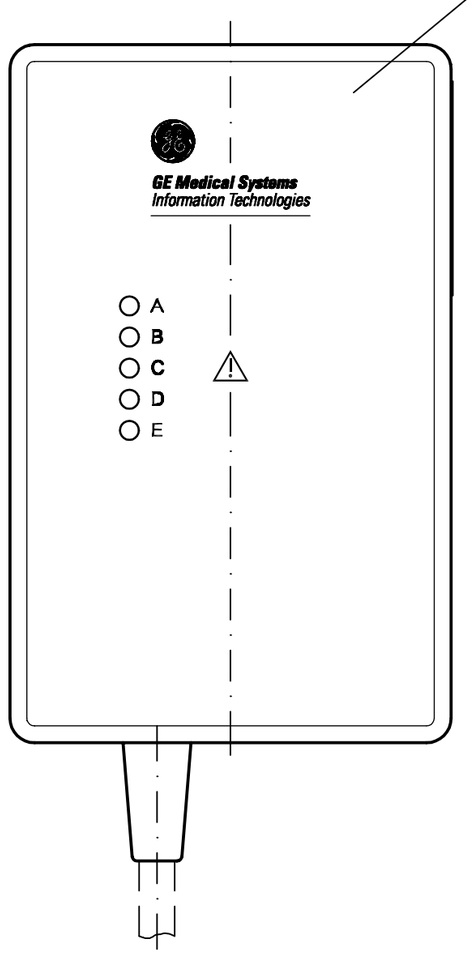


siehe Beschilderungsblatt
see labels catalog

01



2005176-001

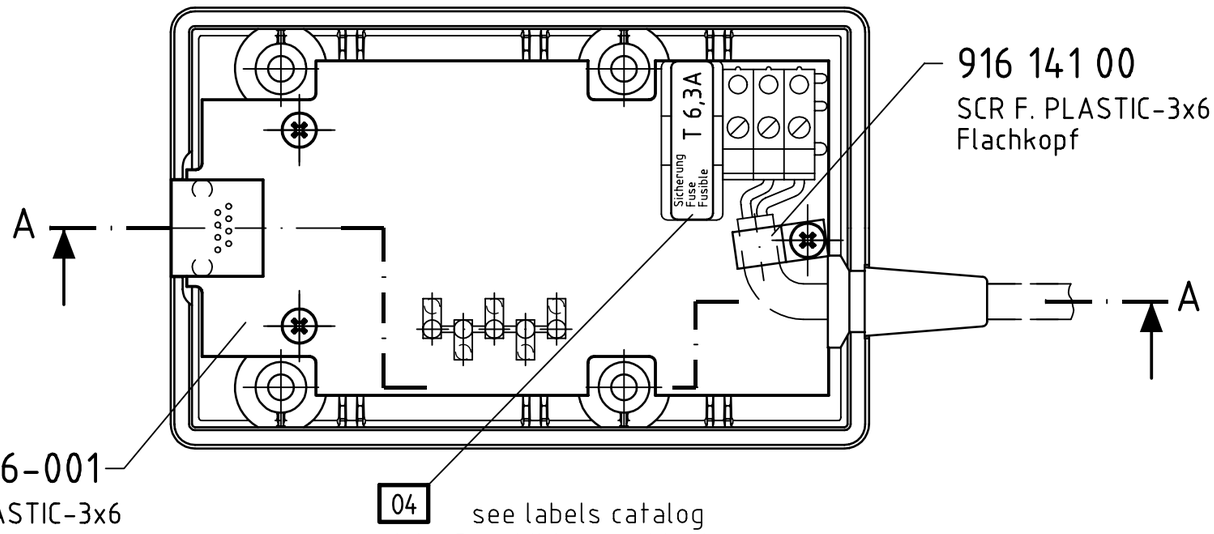


03

05

see labels catalog
siehe Beschilderungsblatt

Ansicht ohne Gehäuse-Oberteil
shown with upper shell removed



916 141 00
SCR F. PLASTIC-3x6
Flachkopf

2004576-001
SCR F. PLASTIC-3x6
Flachkopf

04

see labels catalog
siehe Beschilderungsblatt

GE Medical Systems IT GmbH Munzinger Str. 3 D-79111 Freiburg							
Werkstoff - Material							
Rohteil							
	a	--	MR27024	neu		28.03.01	Koch
	Änd.Index Revision	kommt vor numbers	ECO No.	Änderungsbeschreibung - Change Description		Datum - Date	Name
Freimaßtoleranz - Tolerance	Projektion		Format	Maßstab - Scale	Oberfläche - Finish		Datum - Date / Name
			A3	1:1		Entworfen-Drawn	22.11.00 Koch
File Name 2005693-002__ZM01						Geprüft-Approved	28.03.01 Koch
						Geprüft-Approved	
Dokument Bezeichnung - Document Description doc mech dwg ZM01	Zeichn.Art/Blatt Nr.	Teil Bezeichnung - Part Description				Teil Nr. - Part Number	
Dokument Nr. - Document No. 2005693-002	ZM/01	REMOTE ALARM BOX , RAB				2005693-001	

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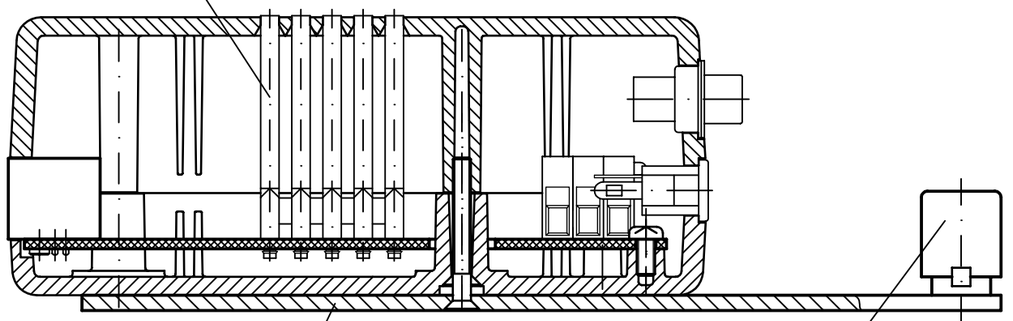
Schutzvermerk nach DIN 34 beachten

Schnitt B-B

915 416 67
Mutter mit Loctite gesichert
nut secured with Loctite

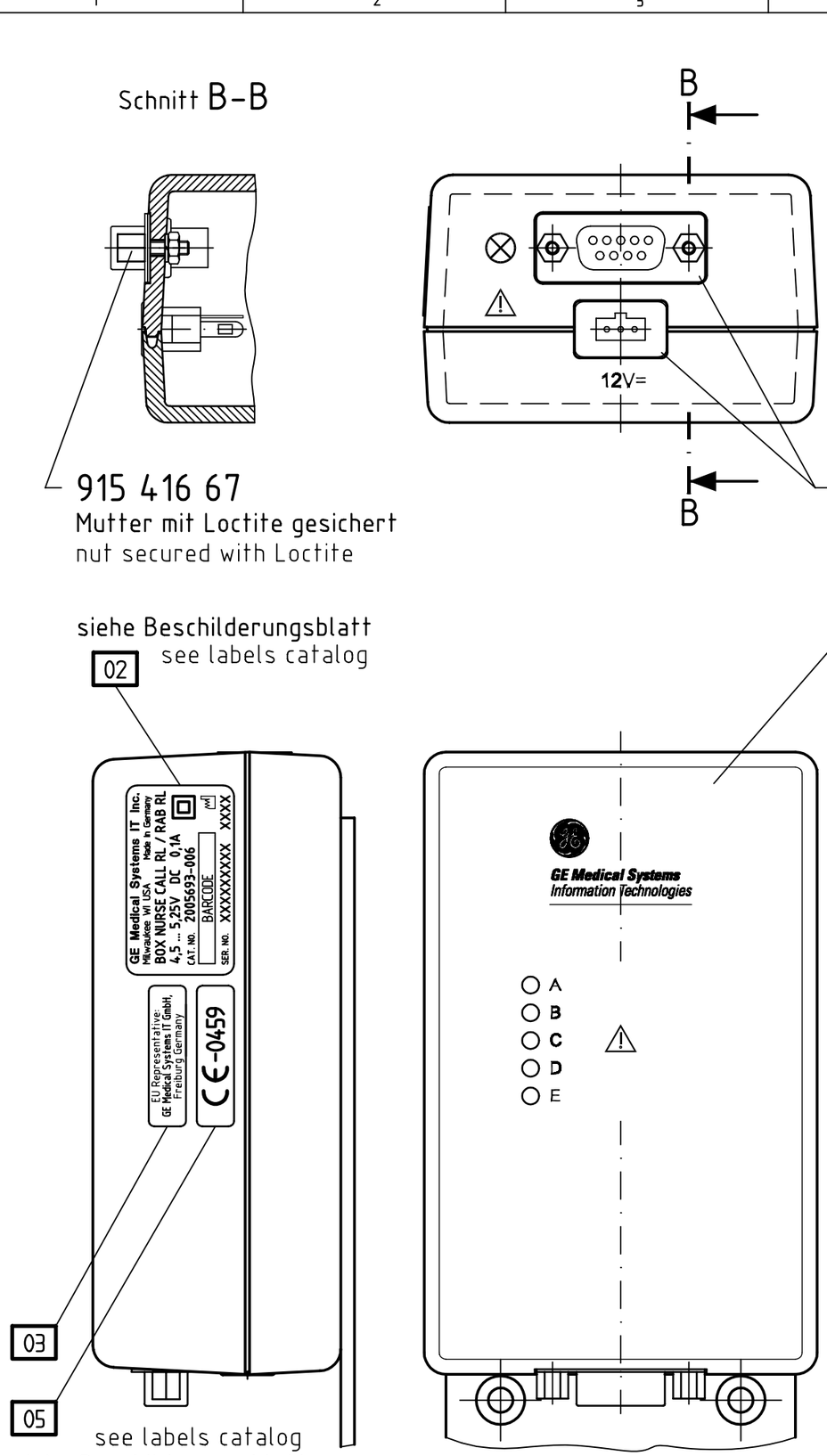
2006227-001

Schnitt A-A
section



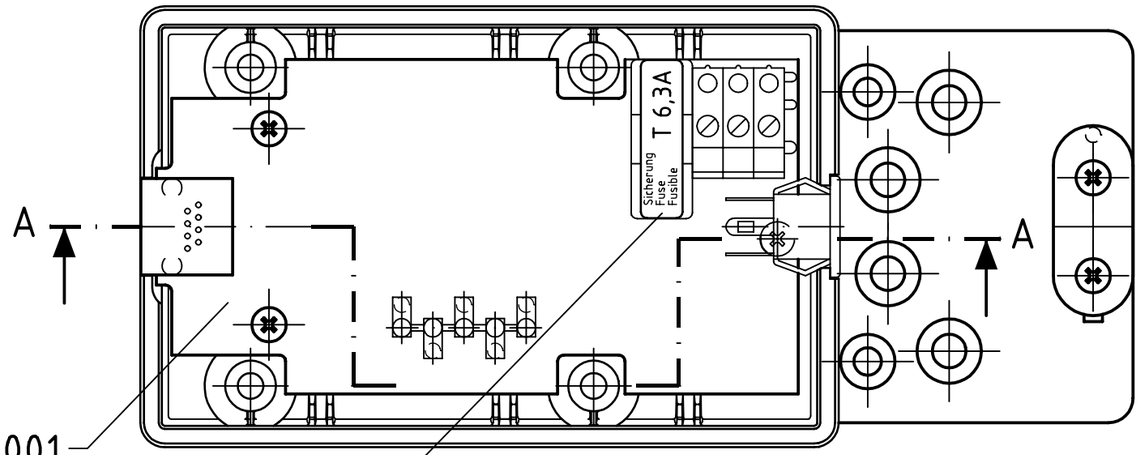
siehe Beschilderungsblatt
see labels catalog
02

2006225-001



see labels catalog
siehe Beschilderungsblatt

Ansicht ohne Gehäuse-Oberteil
shown with upper shell removed



2004576-001
SCR F. PLASTIC-3x6
Flachkopf

04
see labels catalog
siehe Beschilderungsblatt

GE Medical Systems IT GmbH Munzinger Str. 3 D-79111 Freiburg					
Werkstoff - Material					
Rohteil					
	a	--	MR27024	neu	28.03.01 Koch
	Änd.Index Revision	kommt vor numbers	ECO No.	Änderungsbeschreibung - Change Description	Datum - Date / Name
Freimaßtoleranz - Tolerance	Projektion	Format: A3	Maßstab - Scale: 1:1	Oberfläche - Finish	Datum - Date / Name
File Name: 2005693-007_ZM01					Entworfen-Drawn: 17.01.01 Koch Geprüft-Approved: 28.03.01 Koch Geprüft-Approved:
Dokument Bezeichnung - Document Description: doc mech dwg ZM01	Zeichn.Art/Blatt Nr.: ZM/01	Teil Bezeichnung - Part Description: REMOTE ALARM BOX REMOTE LIGHT, RAB RL			Teil Nr. - Part Number: 2005693-006
Dokument Nr. - Document No.: 2005693-007					

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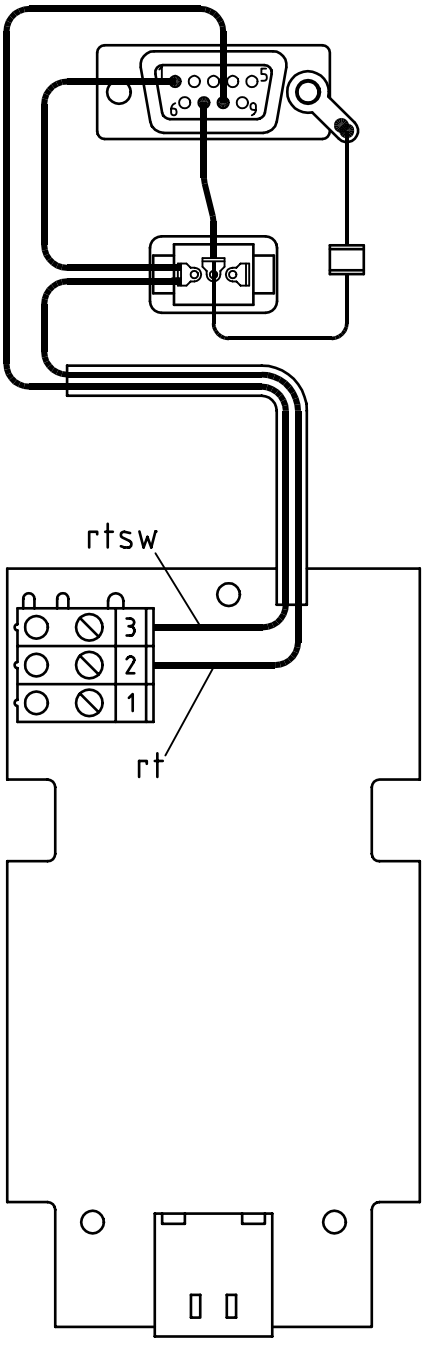
CABLE ASSY
2006227-001



PCB INTFC NURSE CALL
2004576-001

a	--	MR27024	neu	29.03.01	Koch
Änd.Index Revision	kommt vor numbers	ECO No.	Änderungsbeschreibung - Change Description	Datum - Date	Name

					Datum - Date	Name
Projektion	Format	Maßstab - Scale	Oberfläche - Finish	Entworfen-Drawn	28.02.01	Koch
	A4	1:1		Geprüft-Approved	29.03.01	S.Allgeier
				Geprüft-Approved		

GE Medical Systems IT GmbH
Munzinger Str. 3
D-79111 Freiburg

Werkstoff - Material

Rohteil

Freimaßtoleranz - Tolerance

File Name
2005693-008_SZ01

Dokument Bezeichnung - Document Description
doc schem SZ01

Dokument Nr. - Document No.
2005693-008

Zeichn.Art/Blatt Nr.
ZM/01

Teil Bezeichnung - Part Description
REMOTE ALARM BOX REMOTE LIGHT, RAB RL

Teil Nr. - Part Number
2005693-006

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